MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

VOL. XXIX. MAY, 1901. No. 5

INTRODUCTION.

The MONTHLY WEATHER REVIEW for May, 1901, is based on reports from about 3,100 stations furnished by employees and voluntary observers, classified as follows: regular stations of the Weather Bureau, 159; West Indian service stations, 13; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Railway Company, 96; Hawaiian Government Survey, 200; Canadian Meteorological Service, 32; Jamaica Weather Office, 160; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3; Costa Rica Service, 7. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Commander Chapman C. Todd, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San Jose, Costa Rica; Captain François S. Chaves, Director of the Meteorological Observatory, Ponta Delgada, St. Michaels, Azores, and W. M. Shaw, Esq., Secretary, Meteorological Office, London; Rev. Josef Algué, S. J., Director, Phillipine Weather Service.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard of time is that of San Jose, $0^h\ 36^m\ 13^s$ slower than seventy-fifth meridian time, corresponding to $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now always reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

Forecasts of the direction and force of the wind and the state of the weather for the first three days out for the use of steamers bound east from United States ports were regularly made during the month and published on the weather maps issued at Washington, Baltimore, Philadelphia, New York, and Boston, and on a number of dates these forecasts included a notice that conditions favorable for fog were indicated along the western half of the transatlantic steamer routes. On the 3d Lloyds, London, England, was advised by cable that a storm of marked strength was crossing Newfoundland moving eastward.

The most important disturbance of the month in the United States belonged to a type of storms which apparently originate on the eastern slope of the Rocky Mountains, and move thence eastward or northeastward over the Great Lakes, often increasing in intensity, and causing dangerous east to northeast shifting to north and northwest gales. On May 22 the disturbance referred to assumed definite form on the eastern Rocky Mountain slope and moved almost due east over the southern part of the Lake region during the succeeding two days, attended on the 24th by severe gales on Lakes Michigan, Huron, Erie, and Ontario. In this instance the strength of the gales appeared to be due to the rapid development of an area of high barometer over the Lake Superior region rather than to an increase in intensity of the low barometer disturbance. Although ample warning was given to lake ports of the dangerous character of the winds that would attend this storm several small sailing craft were wrecked, and the steamer *Baltimore* ran ashore and was lost off Au Sable, Lake Huron.

Frost occurred on the 4th in the upper Ohio Valley and western New York, and on the 5th in the Rocky Mountain districts as far south as northern New Mexico. On the 6th and 7th frost was reported in the middle-western and northwestern States, and on the 8th from the middle Rocky Mountain region over Minnesota and upper Michigan. From the 10th to the 14th frost conditions extended from the northeastern slope of the Rocky Mountains over the Northwestern States and the upper Mississippi and Ohio valleys, and on the 15th and 16th frost occurred generally in the Lake region. On the 18th and 19th frost was noted in the north Pacific

coast States, from which district it extended over the middle and northern Plateau regions on the 20th and 21st and the Northwestern States on the 22d. During the 25th and 26th frost conditions extended from the Northwestern States over the upper Lake region. The frosts of the month were, as a rule, accurately forecast on the days preceding their occurrence.

Heavy rains caused freshets and damaging floods in the rivers of eastern Tennessee, eastern Kentucky, West Virginia, Virginia, and the Carolinas from the 21st to the 24th. Timely advices or flood warnings were issued in connection with the more important floods in the several States named. On the 16th the Willamette River passed the danger line, 15 feet, at Portland, Oreg. The daily stages of the Willamette were accurately forecast. In Cuba much damage was caused on the 21st and 22d by freshets resulting from heavy rain.

CHICAGO FORECAST DISTRICT.

Frost extended over the Northwest on the 10th, 11th, 12th, and 13th, warnings for the occurence of which were sent out in advance.

A storm moved from the Rocky Mountain region across the central valleys during the 23d and 24th, which was followed by an unusually rapidly rising barometer over the northern Lake region. On the morning of the 23d storm warnings were ordered on Lake Superior for "brisk to high east shifting to north winds." The forecast issued that day for Lakes Michigan and Huron was "brisk and possibly high southerly winds, becoming variable Friday; showers and squalls." On the morning of the 24th northeast storm warnings were extended over Lakes Michigan and Huron, and warning was given to vesselmen that the winds would be dangerous northerly. Several wrecks occurred on the 24th during this storm, and some lives were lost, although high winds were reported only on Lake Michigan and at Duluth. The steamer *Baltimore* in seeking shelter in the storm ran aground in Lake Huron off Au Sable and met with total loss. The other vessels wrecked were generally small sailing craft.—*H. J. Cox, Professor.*

SAN FRANCISCO FORECAST DISTRICT.

The month was remarkable chiefly for the unsettled weather conditions which prevailed during the last decade. The total rainfall at San Francisco was .69 inch (which is the normal for the last thirty years), .66 inch of this fell after May 20. Unusually heavy rains occurred in Utah on the 3d and 4th, a 24-hour rainfall of 2.32 inches being reported at Salt Lake City. An area of high pressure which followed a disturbance that was central over northern Utah and southern Idaho on the 21st was accompanied by killing frosts generally in Nevada and southern Utah. An unusually large number of thunderstorms were reported from the 24th to the 27th.—*A. G. McAdie, Forecast Official.*

PORTLAND, OREG., FORECAST DISTRICT.

No severe storms occurred and no storm warnings were displayed.

Forecasts of frost were issued on the 2d, 17th, 19th, 21st, 29th, and 30th, and they were generally verified.

River forecasts for Portland and The Dalles, Oreg., were made and published daily from the 15th. On the 14th the river at Portland began to rise rapidly and passed the danger-line, 15 feet, the evening of the 16th, and continued above the danger-line the remainder of the month. The daily stages were forecast two or three days ahead, and no 24-hour forecast varied more than three-tenths of a foot from the stage reached, while forecasts for longer periods were relatively as accurate. Large property interests were endangered, but no losses of consequence occurred.—*E. A. Beals, Forecast Official.*

HAVANA, CUBA, FORECAST DISTRICT.

No warnings were issued during the month. Excessive rains on the 21st and 22d caused considerable damage in Havana and vicinity, and high winds and floods caused damage over the island.—*W. B. Stockman, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	1, a.m.	54	114	5, a.m.	39	88	2,025	4.0	506	21.1
II	4, a.m.	51	114	9, a.m.	48	85	1,400	3.0*	467	19.5
III	10, a.m.	53	118	18, a.m.	48	54	4,100	7.0†	586	24.4
IV	24, a.m.	51	104	27, p.m.	28	98	1,925	3.5	550	22.9
Sums							9,450	17.5	2,109	87.9
Mean of 4 paths							2,362		527	22.0
Mean of 17.5 days									540	22.5
Low areas.										
I	1, a.m.	46	106	10, p.m.	40	74	2,625	5.0‡	525	21.9
II	1, p.m.	47	87	3, a.m.	50	64	1,000	1.5	667	27.8
III	6, p.m.	51	120	12, a.m.	48	71	2,600	5.5	473	19.7
IV	12, a.m.	47	84	14, a.m.	49	68	800	1.5§	533	22.2
V	17, a.m.	45	88	18, a.m.	46	74	700	1.0	700	29.2
VI	18, a.m.	39	77	19, p.m.	34	78	425	1.5	283	11.8
VII	19, a.m.	30	108	24, a.m.	48	54	3,425	5.0	685	28.5
VIII	22, a.m.	46	106	25, a.m.	37	76	1,775	3.0	592	24.7
IX	25, a.m.	32	86	28, a.m	41	70	1,575	3.0	525	21.9
Sums							14,925	27.0	4,983	207.7
Mean of 9 tracks							1,658		554	23.1
Mean of 27 days									553	23.0

* Stationary for 2 days. † Stationary for 1 day.
‡ Stationary for 4½ days. § Stationary for ½ day.

RIVERS AND FLOODS.

The stage of the Mississippi River was somewhat lower than during the preceding month, although it remained quite high below the mouth of the Ohio River. The upper Missouri River was higher, and a general rise was in progress as far as Kansas City, Mo., at the close of the month. The Ohio River stages averaged considerably lower than during April, 1901, although they were high during both the opening and closing days of the month.

Flood stages were experienced along the Tennessee River, and the following report of the upper Tennessee flood was prepared by Mr. L. M. Pindell, official in charge of the Weather Bureau office at Chattanooga, Tenn.:

Barometric depressions passed over the Southern States from the 18th to 22d and produced exceedingly heavy rainfall over the Tennessee River system from Chattanooga to the extreme headwaters, beyond our rainfall stations, flooding every stream and tributary, and causing one of the worst floods known over upper east Tennessee, particularly over the tributaries on the south side, including the Holston, Little Tennessee, Hiwassee, Nolachucky, Wautauga, and other streams. The Clinch, French Broad, and Powells did not have as much rainfall over their drainage areas. The total rainfall at the various stations in this center from the 18th to the 22d, inclusive, was as follows: